

# OH in the Solar Spectrum

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Revised identifications of OH lines in the solar spectrum have been made from the detailed laboratory analyses of the  $A^2\Sigma^+ - X^2\Pi$  bands. In the (0, 0), (1, 1), and (2, 2) bands a total of 175 solar lines are ascribed to OH unblended; 124 have OH as a partial contributor. Laboratory intensities along the branches of the separate bands have been used as a guide in making the solar identifications.

A new edition of solar spectrum wavelengths, identifications, and other relevant data, to replace the 1928 edition [1],<sup>1</sup> is in the course of preparation. This program includes the revision of molecular as well as atomic identifications of solar lines. Separate papers giving the solar identifications of individual selected molecules are being prepared. The first paper, *CH in the Solar Spectrum*, has been published [2]. The present paper is the second of this series.

In 1928, 185 solar lines were attributed wholly or partially to OH. The identifications were based on early laboratory measurements of the  $\lambda 3064$  band by Grebe and Holtz [3], supplemented by Fowler's work [4]. Subsequently, Shaw [5] extended the identifications.

In 1948 Dieke and Crosswhite [6] published an extensive analysis of nine bands of the  $A^2\Sigma^+ - X^2\Pi$  system of OH. They used an oxyacetylene flame as the light source, and photographed the spectrum from 2800 Å to 3550 Å in the second order of a 21-ft concave grating having 30,000 lines per inch, and set up in a Paschen mounting. For each line the intensity measurement is given. These measurements were carried out photographically. "The emulsion was calibrated with the help of iron lines of known intensity."

This splendid analysis has been used for the present work. A preliminary report on the revised identifications of OH lines in the solar spectrum was given by the authors in 1957 [7, 8]. Since then some revisions have been made and the counts have been done in more detail. The results are summarized in table 1.

From a study of the intensity measurements along the individual branches it appears doubtful whether lines having a laboratory intensity of about 10 or less are present in the sun. Most of the accessible lines in the last 6 bands listed in table 1 are faint.

High-dispersion solar spectra have the short-wave limit near 2950 Å because of the ozone absorption in the earth's atmosphere. Consequently, some of the OH bands cannot yet be examined in the solar spectrum over the entire range of laboratory observations. The (1, 0) and (2, 1) bands should be present, and may be detected when high-dispersion rocket spectra become available.

In tables 2, 3, and 4, the detailed analyses of the (0, 0), (1, 1), and (2, 2) bands, respectively, are given. These tables are arranged identically. Laboratory data are on the left, and solar data on the right. The rotational quantum numbers of the lines as assigned in the laboratory analyses are entered under the headings for the various branches, O, P, Q, R, and S. Primes denote satellite lines throughout. For example, in table 2, the line of wavelength 3066.114 Å, is a member of the  $R_{2,1}$  branch, and has the quantum number 5 entered in the  $R_1$  column as 5'. Similarly, the line at 3090.270 Å has quantum number 4 in the  $Q_{1,2}$  branch, entered as 4' in the  $Q_2$  column.

Dieke and Crosswhite have assigned individual intensities in cases where a line is blended. If the blending occurs within the same band, the intensities are entered in the table in the order of the rotational lines as read from left to right. For example in table 2, the line at 3091.186 Å is a blend. The intensity of the  $P_1$  contributor is 416; that of the  $Q_{1,2}$  satellite line is 83. In cases where the blending occurs in different bands, an asterisk follows the laboratory wave number.

The solar entries are from the current revision. The wavelengths are from the 1928 edition with a small running correction applied to convert them to the 1928 International Solar Standards [9]. The intensities are the eye estimates as given in Rowland's table [10], with -3 substituted for Rowland's 0000; -2 for 000; and -1 for 00, as was done in 1928.

The differences in wavelength "sun-lab." indicate very good agreement between the measurements in the two sources. For example, in table 2, for the

<sup>1</sup> Figures in brackets indicate the literature references on page 280.

unblended lines the solar wavelengths average 0.007 Å greater than the laboratory measurements. In general, residuals greater than  $\pm 0.030$  Å are tolerated only if the solar line is a blend or is extremely faint.

In assigning solar identifications, judgment enters into the picture inherently. Some investigators are more conservative than others. Complications arise from blending, i.e., a solar line may have more than one contributor to its chemical origin. Many solar lines are produced by blends of atomic and molecular lines. The present assignments are based on the best available data among laboratory spectra. The symbol "[|]" preceding the chemical symbol, denotes a predominant contributor and "|" indicates a contributor stronger than the others. A dash, "—", in this column is used in the case of blends to distinguish the laboratory lines shorter than the solar wavelength from those that are longer. For example, in table 2, the laboratory wavelength of the Fe I line is less than the solar value 3078.044 Å, while that of the OH line is greater. In the case of the solar line at 3082.035 Å, OH is probably a contributor on the long-wave side of a solar line that is not yet completely accounted for as to chemical origin. If "OH" is entered in parentheses in this column, it is masked in the solar spectrum.

Under "Notes", the four letters have the following meaning:

- P OH present in the solar spectrum, unblended.  
 B OH present in the solar spectrum, blended.  
 M OH masked in the solar spectrum.  
 A OH absent from the solar spectrum.

For laboratory lines of OH that are masked by stronger unresolved components, the "OH" entry in the solar identification column applies to the stronger OH line, and the weaker ones are masked. For example see table 4, λ3226.443.

In table 4, only 58 of the total of 159 lines have been compared with the solar ledger. Lines of intensity fainter than about 10 are probably absent, and coincidences between laboratory and solar wavelengths are considered accidental for the fainter lines.

We are deeply indebted to Mrs. Isabel D. Murray for the able assistance she has given in the preparation of these tables.

## References

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- [9] See Trans. Intern. Astron. Union **7**, 151 (1950).
- [10] H. A. Rowland, Astrophys. J. **1** to **5** (1895 to 1897).

TABLE 1. OH in the Solar Spectrum  
Summary

Laboratory					Sun					
Table No.	Electronic transition	Vibrational transition	Wavelength range Å	Total number lines	Strongest solar int. Rowl. est.	Summary of counts				
						Present	Blend	Masked	Absent	Total
2	A <sup>2</sup> Σ <sup>+</sup> —X <sup>2</sup> Π	0, 0	3021 to 3362	283	3	108	63	69	43	283
3		1, 1	3109 to 3378	231	1	52	56	81	42	231
4		2, 2	3184 to 3372	159	—1	15	5	23	15	58
			Total	673		175	124	173	100	572
		3, 3	3253 to 3356	73		0				
		1, 0	2811 to 3050	219		0				
		0, 1	3428 to 3545†	119						
		2, 1	2854 to 3070	186		0				
		1, 2	3483 to 3545†	56						
		3, 2	2944 to 3060	119		0				

† Wavelengths from one plate only; the authors state that the wave numbers should be increased by about 0.2 cm<sup>-1</sup> (see ref. 6).

TABLE 2. OH in the Solar Spectrum  
A  $^2\Sigma^+ - X^2\Pi$  (0, 0)

Laboratory									Sun				
O <sub>2</sub>	P <sub>1</sub> P <sub>2</sub>	Q <sub>1</sub> Q <sub>2</sub>	R <sub>1</sub> R <sub>2</sub>	S <sub>1</sub>	Intensity	Wave number cm <sup>-1</sup>	Wavelength Å	Wavelength Å	Disk int. Rowl. est.	☉-lab. Å	Solar identification	Notes	
				15, 16 14, 17 13 18 12	2+2+2 3+1 4 1 5	33088. 89* 33083. 82 33073. 92 33073. 07 33059. 25	3021. 285 3021. 749 3022. 652 3022. 730 3023. 994	3021. 719   3022. 747	0   3	-0. 030   +0. 017	Mn I	A M A M A	
				11 10 9 8 7	7 9 11 14 18	33039. 96 33016. 31 32988. 40 32956. 39 32920. 61	3025. 760 3027. 927 3030. 490 3033. 433 3036. 730	3027. 890 3030. 484 3033. 434 3036. 754	-1N -3 4d? 2N	-0. 037 -0. 006 +0. 001 +0. 024	-Pd I OH? V II -Ti II	A M P M M	
				6 5 4 3 2	22+3 26 29 30 28	32881. 22* 32838. 48 32792. 81 32744. 63 32694. 55	3040. 368 3044. 325 3048. 565 3053. 051 3057. 727	3040. 35 3044. 333 3048. 569 3053. 068	-3 -2 -3 3	-0. 02 +0. 008 +0. 004 +0. 017	OH OH OH Fe I	P P P M A	
				1	19 402	32643. 36 32632. 25	3062. 523 3063. 565	3062. 52 3063. 555	-1 3	0. 00 -0. 010	OH? OH	P P	
		8, 10, 9'		8' 10'	415+378+44 55 31	32630. 55 32628. 46 32627. 94	3063. 725 3063. 921 3063. 970	3063. 729 3063. 921 3063. 936	2 2	+0. 004 +0. 015 -0. 034	OH Ni II-   Fe I	P P M M	
				7 11 7' 11' 6	415 346 68 27 397	32625. 61 32625. 11 32623. 68 32622. 39 32617. 51	3064. 189 3064. 236 3064. 370 3064. 491 3064. 950	3064. 216 3064. 377 3064. 515 3064. 955	2 1 -2 1	+0. 027 -0. 020 +0. 007 +0. 024 +0. 005	OH-OH Co I Nb II OH	B B M M P	
				12, 6' 12' 5 5' 13	310+83 20 363 100 271	32615. 97 32613. 02 32606. 60 32605. 13 32602. 96	3065. 095 3065. 372 3065. 976 3066. 114 3066. 318	3065. 094  3065. 994 3066. 144 3066. 364	2  2 0 1	-0. 001  +0. 018 +0. 030 +0. 046	[OH Cr I  OH-Mn I OH-Al I Ti II V I	B A B B M	
				13' 4 4'	15 304 114	32599. 82 32593. 16 32591. 92	3066. 613 3067. 240 3067. 356	3067. 262 3067. 386	8 1N	+0. 022 +0. 030	Fe I OH-	A M B	
			10 9		352 373	32588. 68 32587. 47	3067. 661 3067. 775	3067. 657 3067. 781	1 1	-0. 004 +0. 006	OH OH	P P	
			14 14'	11 8	230+323 11+383	32585. 84 32582. 14	3067. 929 3068. 277	3067. 939 3068. 281	2 1	+0. 010 +0. 004	OH-Fe I OH	B P	
				12	290	32578. 63	3068. 608	3068. 598	1	-0. 010	OH	P	
			3 3'		234 126	32577. 61 32576. 60	3068. 704 3068. 799	3068. 725 3068. 796	1 0	+0. 021 -0. 003	[OH-Fe II OH	B P	
				7 13	378 255	32572. 59 32567. 30	3069. 177 3069. 675	3069. 181 3069. 681	2 1	+0. 004 +0. 006	OH OH VI	P B	
			15 15'		193 9	32564. 78 32561. 27	3069. 913 3070. 244	3069. 915	1  3	+0. 002  +0. 021 -0. 053	OH Mn I	P  M M	
			2		152	32560. 48	3070. 318	3070. 265	3	-0. 053		M	

TABLE 2. OH in the Solar Spectrum  
A  $^2\Sigma^+ - X^2\Pi$  (0, 0)—Continued

Laboratory											Sun				
O <sub>2</sub>	P <sub>1</sub>	P <sub>2</sub>	Q <sub>1</sub>	Q <sub>2</sub>	R <sub>1</sub>	R <sub>2</sub>	S <sub>1</sub>	Intensity	Wave number cm <sup>-1</sup>	Wavelength Å	Wavelength Å	Disk int. Rowl. est.	⊙-lab. Å	Solar identification	Notes
282	1				2'			127	32559.53	3070.392	3070.380	-1	-0.012	OH	P
						6		359	32558.79	3070.478	3070.492	1	+0.014	OH	P
						14		218	32551.72	3071.145	3071.145	1	0.000	OH—Fe II	B
					1			69	32542.56	3072.009	3071.965	1	-0.044	Co I	M
					1'			102	32541.99	3072.063	3072.115	3	+0.052	Ti II	M
						5		325	32540.55	3072.199	3072.182	0	-0.017	OH	P
					16			159	32539.38	3072.308	3072.328	3	+0.020	OH—[Co I	B
					16'			6	32535.67	3072.660	3072.670	-2	+0.010	OH?	P
						15		183	32531.76	3073.028	3072.984	6Nd?	-0.044	Ti II	M
						4		273	32517.58	3074.369	3074.385	1	+0.016	OH	P
					17			131	32509.61	3075.123	3075.135	0	+0.012	OH	P
						16		151	32507.38	3075.334	3075.355	0	+0.021	OH	P
					17'			5	32505.77	3075.486					A
						3		204	32489.49	3077.028	3077.027	0	-0.001	OH	P
						17		125	32478.48	3078.071	3078.044	4d?	-0.027	[Fe I—OH	B
					18			102	32475.28	3078.373	3078.387	2	+0.014	OH	P
								239	32474.58	3078.440	3078.445	3	+0.005	OH    Fe I	{ B
								166	32474.28	3078.468			-0.023		
					18'			3	32471.28	3078.753	3078.662	8d?	-0.091	Ti II Fe II	{ M
								437	32458.65	3079.951	3079.979		+0.028		
								152	32458.07	3080.006		4	-0.027	[OH—Fe I	{ M
						2		138	32455.70	3080.231	3080.245	0	+0.014	OH	P
						18		98	32444.91	3081.255	3081.247	2	-0.008	OH Fe I	B
								616	32441.90	3081.541	3081.550	1	+0.009	OH	P
								130	32441.07	3081.620					A
								252	32440.60	3081.665	3081.680	1	+0.015	OH	P
					19			80	32436.38	3082.065	3082.035	1	-0.030	—OH	B
					19'			2	32432.27	3082.456					A
								766	32423.63	3083.278	3083.282	1	+0.004	OH	P
								111	32422.62	3083.374	3083.382	-1	+0.008	OH	P
						1		68	32415.51	3084.050	3084.055	-1	+0.005	OH	P
						19		77	32406.64	3084.894	3084.897	1	+0.003	OH	P
								884	32403.47	3085.196	3085.206	2	+0.010	OH	P
								93	32402.10	3085.317	3085.331	1	+0.014	Cr II	M
					20			66	32392.66	3086.226	3086.229	0	+0.003	OH	P
								335	32390.94	3086.390	3086.400	1	+0.010	Co I—OH	B
					20'			2	32388.38	3086.634	3086.636	-1	+0.002		M
								974	32380.99	3087.338	3087.345	1	+0.007	OH	P
								77	32379.49	3087.481	3087.453	0	-0.028	Fe I—OH	B
						20		59	32363.49	3089.008	3089.000	0	-0.008	OH	P
								995	32355.88	3089.734	3089.745	2	+0.011	OH	P
								62+293+439 +95+100	32354.55	3089.861	3089.868	2	+0.007	OH	P
								94	32350.27	3090.270	3090.222	1N	-0.048	Fe I—Co I	M
								589	32349.29	3090.364	3090.374	1	+0.010	OH	P



3	1'	21	1	70	32348. 40	3090. 449	0	{	+0. 037	{	OH OH	{	B																																								
			139	32348. 15	3090. 473	0			{					OH OH	{	B																																					
			47	32344. 08	3090. 862												1N	{	OH OH	{	B																																
			416+83	32340. 69	3091. 186																	1	{	OH OH	{	P																											
			5	712	32338. 86																						3091. 361	3091. 371	1	{	OH OH	{	P																				
			8	1000	32328. 06																						3092. 394	3092. 403						-3	{	OH OH	{	B															
			8'	50	32326. 15																						3092. 577	3092. 598											4	{	OH OH	{	M										
			6'	71	32325. 38																						3092. 650	3092. 712																1	{	OH OH	{	M					
			6	808	32323. 96																						3092. 786	3092. 851																					-1	{	OH OH	{	P
			21	45	32315. 37																						3093. 609	3093. 608																									
1'	143	32314. 19	3093. 722	3093. 723	-1		{	OH OH		{	P																																										
7'	58	32306. 49	3094. 459	3094. 469		2			{			OH OH	{	P																																							
9	855	32304. 83	3094. 618	3094. 626											3	{	OH OH	{	P																																		
9'	973	32297. 38	3095. 342	3095. 347																-1N	{	OH OH	{	P																													
22	40	32295. 15	3095. 546	3095. 554																					2	{	OH OH	{	A																								
2, 2'	35	32290. 40	3096. 000	3096. 138																										0	{	OH OH	{	B																			
8'	492	32389. 12	3096. 124	3096. 324																															0	{	OH OH	{	B														
8	114+154	32286. 76	3096. 349	3096. 624																																				5	{	OH OH	{	M									
10	48	32283. 62	3096. 650	3096. 902																																									2	{	OH OH	{	P				
10'	873	32281. 74	3096. 830	3098. 588																																														-2	{	OH OH	{
9'	912	32263. 45	3098. 586	3098. 720	-1		{	OH OH		{	B																																										
9	34	32262. 11	3098. 715	3098. 825		0			{			OH OH	{	P																																							
23	31	32261. 16	3098. 807	3099. 235											1	{	OH OH	{	P																																		
23	38	32256. 97	3099. 210	3099. 418																{	{	OH OH	{	B																													
3	860	32254. 86	3099. 411	3099. 575																					1	{	OH OH	{	P																								
5	158	32253. 54	3099. 538	3101. 242																										1	{	OH OH	{	A																			
11	33+215	32252. 97	3099. 593	3102. 148																															2	{	OH OH	{	P														
10'	546	32235. 96	3101. 229	3102. 369																																				0	{	OH OH	{	P									
11'	26	32231. 51	3101. 657	3103. 349																																									1	{	OH OH	{	P				
4	842+30	32226. 47	3102. 142	3104. 349																																														-1	{	OH OH	{
4'	24+871	32224. 23	3102. 358	3105. 464	2		{	OH OH		{	P																																										
4	148	32214. 79	3103. 267	3105. 677		1			{			OH OH	{	P																																							
11'	307	32214. 01	3103. 342	3106. 032											2	{	OH OH	{	P																																		
23	25	32203. 57	3104. 348	3106. 241																3	{	OH OH	{	M																													
11	23	32192. 44	3105. 421	3106. 559																					2	{	OH OH	{	B																								
6	763	32189. 94	3105. 663	3107. 459																										0	{	OH OH	{	B																			
6	43+752	32186. 27	3106. 017	3107. 565																															1	{	OH OH	{	B														
5'	18	32183. 55	3106. 279	3107. 854																																				-1	{	OH OH	{	M									
5	582	32180. 83	3106. 542	3109. 073																																									1	{	OH OH	{	M				
24	131	32171. 36	3107. 457	3109. 333																																														3	{	OH OH	{
13	384	32170. 36	3107. 553	3110. 245	5Nd?		{	OH OH		{	B																																										
12'	19	32167. 27	3107. 852	3110. 529		-1			{			OH OH	{	P																																							
12	18	32154. 66	3109. 069	3112. 077											2	{	OH OH	{	B																																		
24	690	32151. 97	3109. 330	3112. 214																1N	{	OH OH	{	P																													
13'	664	32142. 73	3110. 223	3113. 097																					-1	{	OH OH	{	P																								
7	14+18	32139. 70	3110. 517	3113. 384																										1	{	OH OH	{	P																			
6	607+111	32123. 54	3112. 082	3113. 384																															{	{	OH OH	{	P														
13'	441	32122. 52	3112. 181	3113. 384																																				{	{	OH OH	{	P									
13	44+14	32113. 29	3113. 075	3113. 384																																									{	{	OH OH	{	P				
4	611	32110. 35	3113. 361	3113. 384																																														{	{	OH OH	{

TABLE 2. OH in the Solar Spectrum  
A  $^2\Sigma^+$ —X  $^2\Pi$  (0, 0)—Continued

Laboratory											Sun						
O <sub>2</sub>	P <sub>1</sub>	P <sub>2</sub>	Q <sub>1</sub>	Q <sub>2</sub>	R <sub>1</sub>	R <sub>2</sub>	S <sub>1</sub>	Intensity	Wave number cm <sup>-1</sup>	Wavelength Å	Wavelength Å	Disk int. Rowl. est.	☉-lab. Å	Solar identification	Notes		
5	8	7' 7	14 14'	25				14	32097.35	3114.622	3114.628	-1	+0.006		M		
						569	32095.83	3114.769	3114.778	1	+0.009	OH	P				
						11	32092.65	3115.077	3115.043	1N	-0.034	Fe I	M				
						94	32072.36	3117.048	3117.037	-1	-0.011	OH	P				
									481	32070.89	3117.191	3117.201	1	+0.010	OH	P	
						25			13	32070.03	3117.275	3117.249	0	-0.026	Cr II	M	
									10	32068.18	3117.455	3117.432	-1N	-0.023	Ti I	M	
									527	32065.05	3117.759	3117.768	1	+0.009	OH	P	
									609	32063.74	3117.886	3117.890	2	+0.004	OH—Ti I	B	
									478	32045.43	3119.668	3119.678	1	+0.010	OH CH—Cr I	B	
									8	32042.10	3119.992	3120.012	-1N	+0.020	OH—Fe II	B	
									41	32036.08	3120.578	3120.602	-2	+0.024	OH	P	
						26			10+11	32021.98*	3121.953	3121.969	-1	+0.016	Cr II	M	
									8+63	32019.34*	3122.210	3122.219	0	+0.009	OH CH	M	
									76	32017.43	3122.397				A		
									447	32016.08	3122.528	3122.570	2	{ +0.042 +0.004 }	OH OH—Cr II	B	
									493	32015.69	3122.566						
		6	9	8	15	26				531+48	32001.56*	3123.945	3123.959	1	+0.014	OH	P
										10	31994.69	3124.616	3124.638	-1	+0.022	OH?	P
										399	31991.48	3124.929	3124.918	2	-0.011	CH OH	B
									6	31988.11	3125.258	3125.288	5	+0.030	V II	M	
									6+53	31966.74*	3127.347	3127.362	0	+0.015	OH	M	
									372	31963.32	3127.682	3127.671	2d?	-0.011	[OH] CH	B	
									61	31959.14	3128.091	3128.086	0N	-0.005	OH—OH	B	
									492+16	31957.20*	3128.281	3128.289	1	+0.008	Sc II [OH]	B	
									36+48	31954.81*	3128.515	3128.521	0	+0.006	OH	P	
									7	31940.34	3129.933	3129.947	-1N	+0.014	Y II?	M	
									548	31936.84	3130.276	3130.267	3	-0.009	[V II—OH]	B	
									324	31933.87	3130.567	3130.567	1	0.000	[OH Fe II]	B	
									4	31930.19	3130.928				A		
									7	31913.37	3132.578				A		
									4	31910.47	3132.863				A		
7	10			10' 10	17 17'	27				305	31906.78	3133.225	3133.216	1	-0.009	OH	P
												49	31897.55	3134.132	3134.116	8	-0.016
										475	31895.44	3134.339	3134.337	1	-0.002	[OH Cr II]	B
									265	31872.57	3136.588	3136.590	0	+0.002	OH	P	
									31+505	31869.52	3136.888	3136.890	1	+0.002	OH	P	
									3	31868.61	3136.978				A		
									5	31852.68	3138.547	3138.518	2	-0.029	Fe I	M	
									3	31850.29	3138.783	3138.786	0	+0.003		M	
									250	31846.40	3139.166	3139.164	2	-0.002	OH	P	

8	11'	19	28	38	31832.84	3140.503	3140.511	-2	+0.008	OH	P
	11			445+9	31830.53*	3140.731	3140.757	3	+0.026	[OH—Ca I	B
				5+22	31825.88*	3141.190	3141.181	0	-0.009	Ca I	M
				205	31807.44	3143.011	3143.016	1	+0.005	OH	P
				2	31803.39	3143.412					A
	12	19'	29	459	31799.49	3143.797	3143.764	4	-0.033	[Ti II CH—OH	B
				2	31786.16	3145.115	3145.091	3	-0.024	[Fe I—Cr II	M
				194	31782.09	3145.518	3145.526 {	0	+0.008	OH	P
				26	31781.47	3145.579		0	-0.053		M
	12'			30+15	31765.06*	3147.195	3147.235	3	+0.040	Cr II	M
9	12	20	29	407	31762.53	3147.456	3147.447	1	-0.009	OH—[OH	B
				3	31758.54	3147.851					A
				159	31738.44	3149.844	3149.852	2	+0.008	OH	P
				3	31731.99	3150.485	3150.512	-2	+0.027		M
	13			405	31726.79	3151.001	3151.005	1	+0.004	OH	P
		21	30	151	31713.78	3152.293	3152.262	5	-0.031	[Ti II—OH	B
				23	31694.26	3154.235	3154.200	3	-0.035	[Fe II Ti II	M
				363	31691.53	3154.507	3154.493	1	-0.014	OH Fe I	B
				21+143	31690.39*	3154.621	3154.643	0	+0.022	OH	P
				122	31665.38	3157.112	3157.143	1	+0.031	[OH—Fe IIp	B
10		21	30	2	31657.83	3157.865	3157.882	1	+0.017	[Fe I—V II	M
				350	31651.40	3158.507	3158.521	0	+0.014	OH	P
				115	31641.40	3159.505	3159.531	1	+0.026	[Ni I OH—Cr I	B
				2	31631.34	3160.510					A
	14'			17	31620.45	3161.598					A
	14	22	31	318	31617.51	3161.892	3161.901	0	+0.009	OH	P
				17	31595.81	3164.064	3164.068	0	+0.004	CH	M
				92	31588.27	3164.819	3164.833	1	+0.014	[V II OH	B
				297	31573.14	3166.336	3166.335	0	-0.001	OH	P
	15			88	31564.85	3167.168	3167.177	1	+0.009	OH	P
11		23	31	1	31550.49	3168.609					A
				13	31543.65	3169.296					A
				272+7	31540.50*	3169.613	3169.616	0	+0.003	OH	P
				1	31523.80	3171.292					A
				68	31506.92	3172.991	3172.997	1	+0.006	OH	P
	16	24	32	14	31498.73	3173.816	3173.840	-2	+0.024	OH	P
				248	31492.12	3174.482	3174.490	1	+0.008	OH	P
				65+2	31484.02*	3175.299	3175.314	1	+0.015	OH Fe I	B
				10	31463.81	3177.339	3177.302	2	-0.037	Co I—CH	M
	16'			228	31460.48	3177.675	3177.680	-1	+0.005	OH	P
12	16	25		50	31421.22	3181.645	3181.641	-1	-0.004	OH	P
				186	31408.19	3182.965	3182.990	3	+0.025	[Fe I—Ni I	M
				1+1	31406.08	3183.180					A
				11+48	31398.78	3183.919	3183.964	2	+0.045	V I	M
	17			7	31380.97	3185.727					A
	17'	25		188+3+3	31377.45*	3186.084	3186.104	0Nd?	+0.020	OH	P
				37	31331.06	3190.802	3190.849	2	+0.047	Fe I	M
				164	31321.42	3191.784	3191.799	-1	+0.015	OH	P
				35	31308.97	3193.053	3193.054	-1	+0.001	OH	P
	18										

TABLE 2. OH in the Solar Spectrum

A  $^2\Sigma^+$ —X  $^2\Pi$  (0, 0)—Continued

Laboratory										Sun					
O <sub>2</sub>	P <sub>1</sub>	P <sub>2</sub>	Q <sub>1</sub>	Q <sub>2</sub>	R <sub>1</sub>	R <sub>2</sub>	S <sub>1</sub>	Intensity	Wave number cm <sup>-1</sup>	Wavelength Å	Wavelength Å	Disk int. Rowl. est.	☉—lab. Å	Solar identification	Notes
13	18'	18	26					8	31296.74	3194.301					A
								5	31295.11	3194.467					A
								158	31291.38	3194.848	3194.849	0	+0.001	[OH Ce II?	B
								26	31236.22	3200.489	3200.469	5Nd?	-0.020	Ni I—[Fe I	M
								133	31231.62	3200.961	3200.962	1	+0.001	OH	P
14	19	19'	26					25	31214.52	3202.715	3202.695	0	-0.020	CH OH	B
								4	31206.13	3203.576					A
								124+2	31202.23*	3203.977	3203.980	1	+0.003	OH	P
								6	31191.94	3205.034					A
								102	31138.83	3210.500	3210.480	1	-0.020	OH	P
15	20	20'	27	27				19	31136.65	3210.725	3210.724	-1	-0.001	CH OH	B
								18	31115.28	3212.934	3212.892	2N	-0.042	Mn I	M
								3	31113.99	3213.063					A
								95+4	31109.97*	3213.479	3213.474	-1	-0.005	OH	P
								5	31084.69	3216.092					A
16	21	21'	28	28				78	31042.95	3220.420	3220.433	0	+0.013	OH	P
								13	31032.05	3221.548	3221.545	-2	-0.003	OH	P
								2	31018.77	3222.927	3222.944	-2	+0.017	Fe II?	M
								74	31014.52	3223.369	3223.364	-1	-0.005	OH	P
								13	31011.01	3223.734	3223.744	-2	+0.010	OH?	P
17	22	22'	29					4	30975.13	3227.468					A
								60	30943.87	3230.729	3230.727	1	-0.002	OH [Mn I	B
								9	30922.38	3232.974	3232.938	2	-0.036	Ni I	M
								1	30920.28	3233.193	3233.167	-1	-0.026	Ni I	M
								56	30915.87	3233.654	3233.669	-1	+0.015	OH	P
18	23	23	30	29				9	30901.59	3235.149					A
								3+1	30863.24*	3239.170					A
								45	30841.55	3241.447	3241.489	0	+0.042	Fe I	M
								42+35	30813.99*	3244.346	3244.354	0N	+0.008	OH	P
								6	30807.15	3245.067					A
19	24	24	31	30				6	30786.72	3247.220					A
								2	30748.87	3251.218					A
								33	30735.83	3252.597	3252.609	0N	+0.012	OH	P
								32	30708.50	3255.491	3255.497	1	+0.006	OH—	B
								4	30686.32	3257.812	3257.823	1	+0.011	Cr I	M
20	25	25	32					4	30666.26	3259.976	3259.989	4	+0.013	[Fe I Cr I	M
								1	30632.23	3263.597					A
								24	30626.72	3264.185	3264.185	-1N	0.000	OH	P
								23	30599.58	3267.080	3267.062	1	-0.018	Fe II—OH	B
								3	30539.85	3273.740	3273.720	-3	-0.020		M
21	26	26						17	30514.00	3276.243	3276.262	-1	+0.019	OH	P
								17	30487.11	3279.133	3279.154	1	+0.021	OH	P
								12	30397.55	3288.795	3288.813	0	+0.018	Zr II	M
								12	30370.91	3291.679	3291.697	-1	+0.018	Fe I	M
								9	30277.26	3301.862	3301.869	-3	+0.007	OH? Pt I	B

29	28			8	30250.81	3304.749	3304.754	-1N	+0.005	OH?—	B
				6	30153.06	3315.462					A
	29			6	30126.65	3318.369	3318.367	1Nd?	-0.002	Ti I—Co I	M
30				4	30024.67	3329.641	3329.632	-3N	-0.009	Fe I	M
	30			4	29998.38	3332.558	3332.576	-3N	+0.018		M
31				3	29891.82	3344.439					A
	31			3	29865.33	3347.371	3347.375	-2	+0.004		M
32				2	29754.34	3359.892					A
	32			2	29728.27	3362.839					A

\* Blend.

TABLE 3. OH in the Solar Spectrum  
A<sup>2</sup>Σ<sup>+</sup>—X<sup>2</sup>Π (1,1)

Laboratory											Sun				
O <sub>2</sub>	P <sub>1</sub>	P <sub>2</sub>	Q <sub>1</sub>	Q <sub>2</sub>	R <sub>1</sub>	R <sub>2</sub>	S <sub>1</sub>	Intensity	Wave number cm <sup>-1</sup>	Wavelength Å	Wavelength Å	Disk int. Rowl. est.	☉—lab. Å	Solar identification	Notes
							3 2 1	5 4 3	32147. 10 32101. 06 32053. 54	3109. 801 3114. 262 3118. 879	3109. 803	—3	+0. 002	OH?	P A A
					8			67	32025. 16	3121. 643	3121. 604	3	—0. 039	Ti II    Co I	M
					7			68	32023. 93	3121. 762	3121. 783	1	+0. 021	OH    Fe I	B
				9,8'				65+9	32022. 86	3121. 867	3121. 859	—1	—0. 008	Cr II—OH	B
				7'				11+10	32021. 98*	3121. 953	3121. 969	—1	+0. 016	Cr II	M
				9'				7	32020. 56	3122. 091	3122. 079	0	—0. 012	Ti II	M
				6				63+8	32019. 34*	3122. 210	3122. 219	0	+0. 009	OH CH	B
				6'				13	32017. 81	3122. 360					A
				10				62	32016. 73	3122. 465					A
				10'				6	32014. 36	3122. 696	3122. 664	—1	—0. 032	Fe I	M
				5				57	32011. 67	3122. 958	3122. 949	—1	—0. 009	OH	P
				5'				16	32010. 25	3123. 096	3123. 092	0	—0. 004	Ti I	M
				11				57	32006. 79	3123. 434	3123. 443	—1	+0. 009	OH	P
				11'				4	32004. 20	3123. 687	3123. 698	—3	+0. 011	Fe II?	M
				4				48+531	32001. 56*	3123. 945	3123. 959	1	+0. 014	OH	M
				4'				18	32000. 03	3124. 094	3124. 097	0	+0. 003	Fe I	M
				12				51	31992. 79	3124. 801	3124. 803	—1	+0. 002	OH—Ge I	B
				12'				3	31990. 07	3125. 067	3125. 053	2	—0. 014	Cr II—CH	M
				3				37	31988. 34	3125. 236	3125. 288	5	{ +0. 052 —0. 041 }	V II	{ M M
				3'				20	31987. 38	3125. 329					
					9			60	31977. 16	3126. 329	3126. 332	—2	+0. 003	OH	P
					8			61	31975. 78	3126. 464	3126. 472	—1	+0. 008	OH	P
				13				45	31974. 59	3126. 580	3126. 617	1	{ +0. 037 —0. 001 }	CH OH OH	{ B B
					10			57	31974. 20	3126. 618					
				2				24	31973. 63	3126. 674					A
				2'				20	31972. 91	3126. 745	3126. 767	1	+0. 022	Fe I	M
				13'				3	31971. 62	3126. 871	3126. 847	0	—0. 024	Fe I <sup>p</sup>	M
								62	31969. 91	3127. 038	3127. 047	—1	+0. 009	OH	P
								53+6	31966. 74*	3127. 347	3127. 362	0	+0. 015	OH	P

TABLE 3. OH in the Solar Spectrum  
A<sup>2</sup>Σ<sup>+</sup>—X<sup>2</sup>Π (1,1)—Continued

Laboratory											Sun					
O <sub>2</sub>	P <sub>1</sub>	P <sub>2</sub>	Q <sub>1</sub>	Q <sub>2</sub>	R <sub>1</sub>	R <sub>2</sub>	S <sub>1</sub>	Intensity [100] [100]	Wave number [100] cm <sup>-1</sup>	Wavelength Å	Wavelength [100] Å	Disk int. Rowl. est.	☉-lab. Å	Solar identification	Notes	
1			1		14	6		57	31959.51	3128.055	3128.086	0N	+0.031	OH—OH	B	
						1	11	31957.78	3128.224							
						1'		16+492	31957.20*	3128.281	3128.289	1	+0.008	Sc II  OH	M	
							12	48+36	31954.81*	3128.515	3128.521	0	+0.006	OH	P	
								39	31952.12	3128.779	3128.776	-1	-0.003	OH Y II?	B	
						14'		2	31948.91	3129.093	3129.107	1	+0.014	Fe I	M	
							5	51	31944.43	3129.532	3129.532	-1N	0.000	OH	P	
							13	43	31938.40	3130.123	3130.137	-1N	+0.014	OH—Ti I	B	
						15		33	31925.20	3131.418	3131.446	0	+0.028	OH	P	
							4	43	31924.40	3131.496	3131.526	0	+0.030	OH—Cr II	B	
						15'		2	31921.78	3131.753					A	
							14	37	31917.40	3132.182	3132.189	0	+0.007	OH	P	
							3	32	31899.00	3133.989	3133.966	-1d?	-0.023	Fe II—OH	B	
						16		28	31893.67	3134.514	3134.541	-2	+0.027	OH—OH	B	
								37	31893.01	3134.578			-0.037		B	
						1'		26	31892.80	3134.599	3134.626	-1	+0.027	OH	P	
							15	31	31891.72	3134.705	3134.716	-1	+0.011	OH Hf II	B	
						2		1	31890.01	3134.873					A	
						2'		68	31876.78	3136.174	3136.195	0	+0.021	OH  Fe I	B	
								24	31876.24	3136.227			-0.032		M	
2			3		16	2		22	31867.82	3137.056	3137.025	0	-0.031	Co I?—OH	B	
							26	31861.28	3137.705	3137.710	-1	+0.005	OH	P		
								39	31860.78	3137.749	3137.765	0	+0.016	Co I—OH	B	
								96	31859.31	3137.894	3137.896	-1	+0.002	OH	P	
								20	31858.55	3137.969					A	
						17		23	31857.39	3138.083	3138.076	-1	-0.007	V II—OH	B	
						17'		1	31853.65	3138.452					A	
								120	31840.07	3139.791	3139.761	1	-0.030	V II Sc II—OH	B	
								17	31839.10	3139.886					A	
							1	9+445	31830.53*	3140.731	3140.757	3	+0.026	OH—Ca I	M	
							17	22+5	31825.88*	3141.190	3141.181	0	-0.009	Ca I	M	
								139	31818.60	3141.909	3141.908	2	-0.001	—OH	B	
								15	31817.44	3142.023	3142.021	-2	-0.002	OH	P	
						18		18	31816.17	3142.142	3142.156	-2	+0.014	OH—V II?	B	
								52	31812.39	3142.522	3142.511	-2	-0.011	OH	P	
								152	31794.56	3144.284	3144.326	0	+0.042	CH  OH?	B	
								12	31793.15	3144.424	3144.453	1	+0.029	CH Cr I	M	
								17	31785.59	3145.172	3145.136	2	-0.036	Ni I—	M	
								15	31772.13	3146.504					A	
								43+16	31771.57	3146.560	3146.598	1	+0.038	CH—CH OH	M	
		68	31770.85	3146.631			-0.033		B							
		15	31770.03	3146.712					A							
		158	31767.67	3146.946	3146.934	1	-0.012	OH	P							
7		10+22+11	31766.00	3147.112					A							
7'	1, 1'	15+30	31765.06*	3147.195	3147.235	3	+0.040	Cr II	M							

3	1'	4	19	93	31764.36	3147.274	3147.267	2	-0.007	Fe I—OH	B
		5'		65	31762.99	3147.410	3147.447	1	+0.037	OH—[OH	B
		5		13	31753.91	3148.309	3148.307	-1	-0.002	—OH?	B
				112	31752.72	3148.427	3148.440	3	+0.013	[Fe I OH Cr I	B
				14	31740.03	3149.687					A
		8		163+11	31737.73	3149.915	3149.898	1	-0.017	OH	P
		8'		8+127	31736.31	3150.056	3150.077	1	+0.021	OH—Cr II	B
		6		22	31733.71	3150.314	3150.307	1	-0.007	—OH	B
		7'	20	12	31718.69	3151.806					A
				9	31717.10	3151.964					A
4	2'	7		136	31715.47	3152.125	3152.117	0	-0.008	OH	P
				76	31712.16	3152.454	3152.457	-1	+0.003	OH	P
		2		24	31707.21	3152.947	3152.957	0	+0.010	OH—OH	B
		2		18	31707.01	3152.967		0	-0.010		
		9		156	31704.62	3153.204	3153.191	3	-0.013	[Fe I OH	B
		9'		6	31702.60	3153.405					A
		8'		8	31692.20	3154.445	3154.420	1	-0.025	Fe I	M
		8		143+21	31690.39*	3154.621	3154.595	0	-0.026	Ni I—[OH	B
			20	11	31689.32	3154.727					A
				25	31674.69	3156.184	3156.190	-3	+0.006	OH	P
5	3'			33	31674.12	3156.241	3156.272	2	+0.031	Fe I	M
				148	31668.20	3156.831	3156.845	0	+0.014	OH	P
		10		5	31665.98	3157.052	3157.031	2	-0.021	Fe I	M
		10'		6	31663.32	3157.317	3157.294	0	-0.023		M
		9'	21	9	31661.95	3157.454					A
				138	31661.26	3157.523	3157.501	1N	-0.022	—OH	B
				85	31659.36	3157.712	3157.751	0	+0.039	CH OH?	B
		4'		23	31636.55	3159.989					A
		4		48	31635.77	3160.067	3160.082	-1	+0.015	OH—Cr II	B
			21	8	31633.08	3160.336	3160.347	1	+0.011	Fe I	M
6	11'	10'		5	31630.38	3160.605	3160.612	-1	+0.007	Cr I CH	M
		10		137+133	31628.22	3160.821	3160.801	1	-0.020	V II—[OH	B
		11'		4	31625.95	3161.048	3161.033	0	-0.015	Mn I	M
				7	31610.35	3162.609	3162.570	4	-0.039	Ti II	M
				92	31604.30	3163.214	3163.223	0	+0.009	OH	P
			22	7	31599.67	3163.678	3163.683	-3	+0.005		M
		11'		20+4	31593.48	3164.297	3164.295	1	-0.002	Fe I Zr II	B
		5		60	31592.51	3164.394	3164.418	0	+0.024	OH	P
		11		124	31590.97	3164.548	3164.548	0	0.000	OH	P
		12		124	31584.96	3165.151	3165.157	1	+0.006	OH Fe ip	B
7	12'			3	31582.40	3165.407	3165.420	-1	+0.013	Zr II	M
				6	31571.17	3166.534					A
				3	31552.55	3168.402					A
		12'	22	114	31549.90	3168.668	3168.672	0	+0.004	OH	P
		12		95	31546.77	3168.982	3168.955	1	-0.027	—OH	B
				18	31546.02	3169.058	3169.075	-2	+0.017	OH—Fe ip	B
		6'		69	31544.86	3169.174	3169.192	-2	+0.018	[OH—Cr II	B
		6		7+272	31540.50*	3169.613	3169.616	0	+0.003	OH	M
		13		110	31537.98	3169.866	3169.861	0	-0.005	OH	P
		13'		2	31535.18	3170.148	3170.128	-1	-0.020		M



TABLE 3. OH in the Solar Spectrum  
A  $^2\Sigma^+$ —X  $^2\Pi$  (1,1)—Continued

Laboratory											Sun					
O <sub>2</sub>	P <sub>1</sub>	P <sub>2</sub>	Q <sub>1</sub>	Q <sub>2</sub>	R <sub>1</sub>	R <sub>2</sub>	S <sub>1</sub>	Intensity	Wave number cm <sup>-1</sup>	Wavelength Å	Wavelength Å	Disk int. Rowl. est.	☉—lab. Å	Solar identification	Notes	
5	8	7'	13	13'	23	23		5	31531.66	3170.502	3170.481	—1	—0.021		M	
								2	31508.67	3172.815				A		
								101	31504.86	3173.198	3173.210	0	+0.012	OH	P	
								5	31503.56	3173.329				A		
								15	31494.57	3174.235	3174.221	0	—0.014	Fe ip	M	
		7	14	14'				75	31493.16	3174.377	3174.380	0	+0.003	OH	P	
								96	31487.30	3174.968	3174.953	1	—0.015	OH	P	
		8	14'	14				95	31486.60	3175.039	3175.045	0	+0.006	[Sn I OH	B	
								2+65	31484.02*	3175.299	3175.314	1	+0.015	OH Fe I	M	
								6	31464.92	3177.227				A		
		6	9	9'	15	15'	24		2	31458.98	3177.826	3177.822	—1d?	—0.004		M
									4	31457.66	3177.960				A	
									89	31455.88	3178.140	3178.161	1	+0.021	OH	P
									12	31439.22	3179.824				A	
									78	31437.64	3179.984	3179.966	—1	—0.018	OH	P
10	16			16'	24			82	31432.83	3180.470	3180.491	0	+0.021	OH	P	
								1+4	31429.95	3180.762	3180.746	2	—0.016	Fe I	M	
								95	31423.71	3181.393	3181.420	0	+0.027	OH Cr II	B	
								1+1	31406.08*	3183.180				A		
								76	31402.83	3183.509	3183.520	—2	+0.011	OH	P	
7	11	9	16	16'	25		6	31385.40	3185.277					A		
							10	31380.30	3185.795	3185.804	—2N	+0.009	OH	P		
							81	31378.50	3185.977	3185.979	0	+0.002	OH	P		
							3+188+3	31377.45*	3186.084	3186.104	0	+0.020	OH	M		
							69	31374.47	3186.387	3186.383	0	—0.004	OH	P		
		10	16'	16	25			1+9	31370.78*	3186.762	3186.752	3	—0.010	Fe II	M	
								88	31358.00	3188.010	3188.034	1	+0.024	OH Cr I	B	
								1+3	31350.14	3188.860				A		
								64	31345.70	3189.312	3189.317	0	+0.005	OH	P	
								8+8	31317.74*	3192.158				A		
		10	17	17'	26			76	31315.80	3192.356	3192.396	0	+0.040	Fe I	M	
								57+7	31312.12*	3192.732	3192.724	—2	—0.008	OH	P	
								1	31308.07	3193.145				A		
								5	31302.07	3193.757	3193.734	—1N	—0.023	Fe ip Fe ip	M	
								82	31289.40	3195.051	3195.085	0	+0.034	CH OH	B	
8	12	11'	18	18			1	31288.59	3195.133	3195.140	—1	+0.007	Ru II CH	M		
							54	31284.47	3195.554	3195.593	2	+0.039	Ni I—Y II	M		
							2, 3	31264.35*	3197.610	3197.596	—1	—0.014	V II?—CH	M		
							6	31251.95	3198.879	3198.902	—2N	+0.023	Fe I?—Ir I?	M		
							72+3	31249.76*	3199.103	3199.137	0	+0.034	OH—	B		
		12	18	18				46+3	31245.66*	3199.523	3199.527	4	+0.004	Fe I	M	
								43	31219.00	3202.255	3202.257	—1	+0.002	OH	P	
								75	31217.83	3202.376	3202.382	0	+0.006	[V I OH	B	
								4	31215.09	3202.657	3202.667	0	+0.010	Fe ip	M	
								5	31182.67	3205.986	3206.007	1	+0.021	Ti II	M	
		12'														

9	12	19	19	67	31180. 23	3206. 237	3206. 238	0	+0. 001	OH	P
				37	31175. 02	3206. 773	3206. 763	GNd?	-0. 010	—OH	B
				35+14	31149. 18*	3209. 433	3209. 434	-1	+0. 001	OH	P
				67	31143. 17	3210. 043	3210. 046	0	+0. 003	OH	P
10	13	20	20	3+3	31124. 70*	3211. 958					A
				4+95	31109. 97*	3213. 479	3213. 474	-1	-0. 005	OH	M
				60	31107. 44	3213. 740	3213. 744	0	+0. 004	OH—Fe I	B
				29	31100. 10	3214. 499	3214. 494	-2	-0. 005	OH	P
11	13'	20	20	27	31075. 04	3217. 091	3217. 097	1	+0. 006	V I  V II	M
				58+ 5+4	31065. 67*	3218. 061	3218. 075	-1	+0. 014	OH	P
				3	31034. 10	3221. 335					A
				3+53	31031. 29	3221. 627	3221. 659	2	+0. 032	Ni I	M
12	14	21	21	22	31020. 73	3222. 750	3222. 729	-2N	-0. 021	Ti I	M
				21	30996. 33	3225. 260	3225. 267	-1	+0. 007	OH	P
				50+ 9+3	30984. 97*	3226. 443	3226. 446	-1	+0. 003	OH	P
				2	30954. 87	3228. 579					A
13	15	22	22	46	30951. 88	3228. 892	3228. 900	0	+0. 008	[Fe I OH	B
				17+ 10+1	30936. 75*	3231. 473	3231. 472	-1	-0. 001	OH	P
				2	30934. 68	3231. 689	3231. 707	1	+0. 018	Fe II Zr II	M
				16	30913. 01	3233. 954	3233. 976	2	+0. 022	[Fe I Mn I	M
14	16	23	23	42	30901. 10	3235. 200	3235. 187	-1	-0. 013	Fe I—OH	B
				2	30872. 32	3238. 216	3238. 213	-2	-0. 003	Ti I	M
				39	30869. 17	3238. 547	3238. 553	-1	+0. 006	OH	P
				13	30848. 20	3240. 748					A
15	16'	24	24	2	30835. 17	3242. 118	3242. 108	-3N	-0. 010		M
				13	30824. 92	3243. 196	3243. 214	-2	+0. 018	OH	P
				35+42	30813. 99*	3244. 346	3244. 354	0N	+0. 008	OH	P
				32	30782. 97	3247. 615	3247. 569	10	-0. 046	Cu I	M
16	17	25	25	9+12	30754. 71*	3250. 600	3250. 637	3N	+0. 037	Fe I	M
				9	30731. 86	3253. 017	3253. 038	-2	+0. 021	OH	P
				29+ 2+2	30723. 76*	3253. 875	3253. 844	2N	-0. 031	Fe I	M
				27	30693. 41	3257. 092	3257. 103	2	+0. 011	OH—[Fe I	B
17	18	26	26	7	30656. 06	3261. 061	3261. 065	-1	+0. 004	Cd I	M
				7+ 1+1	30633. 70*	3263. 441	3263. 466	-3	+0. 025	Fe II	M
				23	30630. 09	3263. 826	3263. 838	0N	+0. 012	OH—	B
				22	30600. 42	3266. 990	3266. 950	1	-0. 040	Fe II	M
18	19	27	27	5	30552. 13	3272. 154					A
				18	30532. 97	3274. 208	3274. 226	1	+0. 018	OH—[Fe II	B
				5	30530. 13	3274. 513					A
				17+7	30503. 90*	3277. 328	3277. 358	7d?	+0. 030	Fe II	M
19	20	28	28	3	30442. 80	3283. 906	3283. 933	-1	+0. 027		M
				14	30432. 37	3285. 032	3285. 022	0N	-0. 010	[V II OH	B
				3+1	30421. 17*	3286. 242	3286. 258	-2	+0. 016	Sm II	M
				14	30403. 78	3288. 121	3288. 155	3	+0. 034	Ti II—	M
20	21	29	29	11	30328. 14	3296. 322					A
				2+5	30327. 68*	3296. 372	3296. 377	-2N	+0. 005	Zr II	M
				2	30306. 32	3298. 695	3298. 691	2	-0. 004	Co I	M
				10	30299. 95	3299. 389					A
21	22	30	30	8+4	30220. 11*	3308. 106	3308. 111	0N	+0. 005	NH	M
				8	30192. 40	3311. 142	3311. 110	0	-0. 032	NH	M

TABLE 3. OH in the Solar Spectrum  
A<sup>2</sup>Σ<sup>+</sup>—X<sup>2</sup>Π (1, 1)—Continued

Laboratory										Sun					
O <sub>2</sub>	P <sub>1</sub>	P <sub>2</sub>	Q <sub>1</sub>	Q <sub>2</sub>	R <sub>1</sub>	R <sub>2</sub>	S <sub>1</sub>	Intensity	Wave number cm <sup>-1</sup>	Wavelength Å	Wavelength Å	Disk int. Rowl. est.	☉—lab. Å	Solar identification	Notes
	24							6	30108. 36	3320. 385	3320. 379	—3	—0. 006		M
		24						6	30081. 91	3323. 415	3323. 395	1	—0. 020		M
	25							5	29992. 50	3333. 212	3333. 222	—2 <i>N</i>	+0. 010		M
		25						5	29965. 35	3336. 232	3336. 260	2	+0. 028	Fe I	M
	26							4	29872. 41	3346. 611	3346. 602	—3 <i>N</i>	—0. 009		M
		26						4	29845. 53	3349. 627	3349. 652	—1	+0. 025	Cr II?	M
	27							3	29748. 07	3360. 601	3360. 607	0	+0. 006	NH	M
		27						3	29721. 36	3363. 621	3363. 616	1	—0. 005	Ni I	M
	28							2	29619. 12	3375. 232	3375. 215	—3	—0. 017	Co I?	M
		28						2	29592. 56	3378. 261					A

\*Blend.

TABLE 4. OH in the Solar Spectrum  
A<sup>2</sup>Σ<sup>+</sup>—X<sup>2</sup>Π (2, 2)

Laboratory										Sun				
O <sub>2</sub>	P <sub>1</sub>	P <sub>2</sub>	Q <sub>1</sub>	Q <sub>2</sub>	R <sub>1</sub>	R <sub>2</sub>	Intensity	Wave number cm <sup>-1</sup>	Wavelength Å	Wavelength Å	Disk int. Rowl. est.	⊙—lab. Å	Solar identification	Notes
					7		10	31391. 16	3184. 692					A
					6		9	31390. 37	3184. 772					
					7'		2	31389. 41	3184. 869					
					6'		2	31388. 82	3184. 930					
					8		10	31388. 31	3184. 981					A
					5, 8'		8+1	31386. 21	3185. 195					
					5'		2	31384. 81	3185. 337					
					9		10	31381. 60	3185. 663	3185. 674	0	+0. 011		M
					9'		1	31379. 49	3185. 877					
					4		7	31379. 00	3185. 927					
					4'		3+188+3	31377. 45*	3186. 084					
					10		9+1	31370. 78*	3186. 762	3186. 752	3	—0. 010	Fe II	M
					3, 10'		5+1	31368. 88	3186. 955					
					3'		3	31367. 97	3187. 047					
					2		4	31356. 63	3188. 200					
					11, 2'		9+3	31355. 76	3188. 289					
					1, 1'		2+3	31342. 84	3189. 604					
						8	9	31337. 94	3190. 101	3190. 104	1	+0. 003	CH	M
					12	7	8+9	31336. 18	3190. 280	3190. 294	—2	+0. 014	OH	P
						9	9	31335. 04	3190. 397	3190. 404	—2	+0. 007	OH?	P
						6	9	31329. 35	3190. 976					
						10	9	31327. 37	3191. 178					
						5	8+8	31317. 74*	3192. 158					
						11	8	31314. 95	3192. 443					
					13		7+57	31312. 12*	3192. 732					

1	1, 1'	14	4	6	31300.75	3193.892	1	-0.016	Ti II Fe I	M
			12	8	31297.66	3194.207				
				6	31283.65	3195.638				
				5+4	31281.46	3195.862				
			3	5	31278.35	3196.189				
			13	7	31275.35	3196.485				
				10	31264.87	3197.557				
				3+2	31264.35*	3197.610				
				6	31250.96	3198.980				
			15	5	31250.13	3199.065				
2	2, 2'	15	2	3+72	31249.76*	3199.103	1	-0.031	Ti I	M
			14	6	31248.38	3199.244				
				14	31246.60	3199.426				
				3+46	31245.66*	3199.523				
				18	31226.19	3201.518				
				3	31225.30	3201.609				
			1, 15	2+5	31216.12	3202.551				
				5	31211.52	3203.023				
				8	31203.85	3203.810				
				21	31203.34	3203.863				
3	3, 3'	16		2+124	31202.23*	3203.977	-1	+0.015	OH	P
				4	31178.77	3206.388				
				22	31177.50	3206.518				
				2	31176.21	3206.651				
			17	4	31167.76	3207.521				
				6+2	31158.54	3208.469				
				2	31157.54	3208.572				
				10	31156.80	3208.648				
				10+3+2	31155.34	3208.799				
				2	31150.10	3209.338				
4	4, 4'	17		14+35	31149.18*	3209.433	-1	+0.001	OH	M
				24	31148.53	3209.500				
				2	31147.03	3209.655				
				2	31137.29	3210.659				
				17+4	31136.04	3210.788				
				3+3	31124.70*	3211.958				
				2	31119.28	3212.517				
				3	31118.57	3212.590				
				19	31117.96	3212.653				
				24	31116.24	3212.831				
5	5, 5'	18		1	31114.57	3213.003	-2N	+0.020	OH	P
				11	31104.99	3213.993				
				3+4	31097.53	3214.764				
				1	31096.72	3214.848				
				20	31095.16	3215.009				
				3	31087.49	3215.803				
				24	31080.44	3216.532				
				1	31078.50	3216.732				
				1	31069.52	3217.662				
				21	31067.82	3217.839				

TABLE 4. OH in the Solar Spectrum  
A  $^2\Sigma^+ - X^2\Pi$  (2, 2)—Continued

Laboratory										Sun					
O <sub>2</sub>	P <sub>1</sub>	P <sub>2</sub>	Q <sub>1</sub>	Q <sub>2</sub>	R <sub>1</sub>	R <sub>2</sub>	Intensity	Wave number cm <sup>-1</sup>	Wavelength Å	Wavelength Å	Disk int. Rowl. est.	☉—lab. Å	Solar identification	Notes	
4	5	3, 3'	10 10'		19		5 + 4 + 58	31065. 67*	3218. 061	3219. 429 3220. 607	-3 -1	-0. 006 -0. 006	OH? Co I	P M	
							3	31063. 77	3218. 258						
							13	31052. 42	3219. 435						
							22	31041. 05	3220. 613						
							1	31038. 92	3220. 834						
		4'	4	9' 9	19		1	31037. 97	3220. 933	3221. 135	-2	+0. 005	OH—Ti I	B	
							21	31036. 09	3221. 130						
							2	31033. 49	3221. 398						
							3	31028. 02	3221. 966						
							7	31027. 31	3222. 040						
	6		11	10' 10	20		2	31103. 28	3224. 537	3224. 925 3225. 122	0 -3	+0. 044 +0. 029	Fe I OH	M P A	
							1	31002. 17	3224. 653						
							20	30999. 98	3224. 881						
							21	30997. 79	3225. 093						
							14	30997. 24	3225. 166						
		5, 5'	11'	11	20		1	30995. 51	3225. 346	3226. 446	-1	+0. 003	OH	M	
							9 + 3 + 50	30984. 97*	3226. 443						
							2	30973. 74	3227. 613						
							19	30959. 61	3228. 086						
							19	30950. 83	3230. 002						
	7	6'	12				14	30939. 35	3231. 201	3231. 222	-3	+0. 021	OH?—Ce II	B	
							3	30937. 73	3231. 370						
							1 + 10 + 17	30936. 75*	3231. 473						
							18	30914. 94	3233. 752						
							17	30899. 79	3235. 338						
		7'	7	13				2	30885. 95	3236. 787	3236. 923 3237. 583 3238. 897	-2 -2 -1N	-0. 003 +0. 012 +0. 012	OH OH OH—	P P B
								11	30884. 62	3236. 926					
								14	30878. 47	3237. 571					
								16	30865. 95	3238. 885					
								1 + 3	30863. 24*	3239. 170					
	8		14				15	30844. 71	3241. 115	3241. 138 3242. 834 3244. 495	-3 -2 -1	+0. 023 +0. 015 +0. 003	OH?—Sm II OH OH—	B P A B	
							2	30830. 03	3242. 658						
							12	30828. 51	3242. 819						
							14	30814. 55	3244. 287						
							14	30812. 58	3244. 495						
		9	8'	14				1 + 13	30785. 44	3247. 355	3250. 637 3251. 353	3N 1N	+0. 037 -0. 011	Fe I Fe IIp Sc II?	A M M
								2	30770. 13	3248. 971					
								12	30768. 41	3249. 153					
								12 + 9	30754. 71*	3250. 600					
								13	30747. 49	3251. 364					

10'	16		11	30721. 82	3254. 080	3254. 060	1N	-0. 020	Mn I	M
	10		1	30706. 41	3255. 713					
			12+1	30704. 48*	3255. 918	3255. 901	6	-0. 017	Fe II	M
			1+1	30703. 60*	3256. 010					
	16		10+1	30692. 47*	3257. 192					A
			13	30677. 20	3258. 814	3258. 783	3	-0. 031	Fe II	M
11			9+2+2	30653. 79*	3261. 302					A
	17		1+2	30638. 59*	3262. 920					
11'			11	30636. 79	3263. 112	3263. 133	-3	+0. 021	OH	P
11			9	30625. 62	3264. 302					
	17									
12			12+1	30603. 61*	3266. 650	3266. 676	3N	+0. 026	Cr I—	M
	18		8	30581. 21	3269. 043					
12'			1+1	30567. 65*	3270. 493					
12			10	30565. 36	3270. 738	3270. 749	-3N	+0. 011	OH	P
	18		8	30553. 98	3271. 956					
13			10+1	30526. 69*	3274. 881	3274. 909	1	+0. 028	Ni II	M
	19		7+17	30503. 90*	3277. 328					
13			9	30490. 25	3278. 795					
	19		7	30477. 58	3280. 158					
14			9	30446. 32	3283. 526					
	20		6	30421. 81	3286. 172					
			8	30411. 45	3287. 291					
14			6	30396. 26	3288. 934					
15	20		8	30362. 54	3292. 587					
	21		5	30334. 62	3295. 617					
			7	30328. 91	3296. 238					
15			5	30309. 73	3298. 325					
	21		7	30275. 12	3302. 095					
16			6+4	30242. 63	3305. 643	3305. 627	-2N	-0. 016	Fe II	M
16	22		4	30217. 95	3308. 342					
	22									
17			6	30184. 11	3312. 051					
	17		5	30152. 65	3315. 507					
			3	30144. 34	3316. 421					
	23		3+3	30120. 44*	3319. 053					
18			5	30089. 32	3322. 485					
	23									
			4+3	30058. 68*	3325. 873					
18			4	29990. 76	3333. 405					
19			4	29960. 78	3336. 741					
20			3	29888. 18	3344. 846					
	20		3	29858. 81	3348. 136					
21			3	29781. 53	3356. 825					
	21		2	29752. 48	3360. 072					
22			2	29670. 76	3369. 367					
	22		2	29642. 30	3372. 592					

\*Blend.

WASHINGTON, D.C.

(Paper 63A3-23).